

ISCAST Thinkling 21-08-2010

New Developments in Military Technology: The Convergence of Swords and Ploughshares?

James Garth, BEng (Aero) (Hons), MAIAA, AMRAeS

UNCLASSIFIED



A-10 Thunderbolt II



GAU-8 Avenger Gatling Gun



30mm round for GAU-8



Victims of a Sept 1944 air raid on Berlin

Victims of the bombing of Dresden awaiting cremation
Total killed: 30,000






Victims of aerial bombardment of Tokyo
Total killed: 100,000



Casualties of a mass
panic during Japanese
aerial bombing in
Chongqing, 1941



Victims of the Blitz, London
Total killed: 43,000 (UK)

RAAF Doctrine



A declaration of war is recognition that, with respect to a certain group of people in a certain context, normal ethical rules do not necessarily apply. A declaration of war must also contain two additional criteria:

- the moral justification for making the declaration
- the conditions under which the suspension of normal ethical rules will end

Fundamentals of Australian Aerospace Power, 4th Ed. (2002)

- The suspension of normal ethical rules is *conscious and temporary*

RAAF Doctrine



During the prosecution of a war, we should surely seek to suspend as few ethical restrictions as possible. Just because we have declared war does not mean that all bets are off and anything goes - condoning the worst sorts of barbarism and perfidy. Declaration of war is not a blanket approval of atrocity, nor even a glorification of vendetta. It is, however, an acknowledgement that in certain emergency contexts our highest values cannot be protected without taking actions that would otherwise be ruled out by normal ethical restrictions

Fundamentals of Australian Aerospace Power, 4th Ed. (2002)

Four Positions

- Absolute Pacifism
- Nonviolent Resistance
- Just War
- Preventative War (Crusade)

Absolute Pacifism

- Strengths
 - Literally endorses 'Sermon on the mount'
 - Simple, uncompromising
 - Refreshingly unambiguous
- Weaknesses
 - Blanket abrogation of historical OT views
 - Seems utterly powerless in the face of heinous evil

Nonviolent Resistance

- Strengths

- Avoids harm to the enemy; obeys Sermon on the Mount from a personal perspective
- Still gives Christians the opportunity to participate in acts of resistance

- Weaknesses

- Seems to be a 'have a bet each way' position.
- May tacitly support conflicts where enemies may be harmed
- By definition, implies that all front-line combat divisions (or police forces) ought to be wholly devoid of Christians. Is this a good thing?

Just War

- Strengths

- Baptized into 'legitimacy' by Augustine
- Defensive in nature

- Weaknesses

- Reactive, not corrective
- Criteria for 'Just War' are ambiguous – and who adjudicates on whether criteria are met?
- Has there ever been a 'Just War' in history?

Preventative War (Crusade)

- Strengths

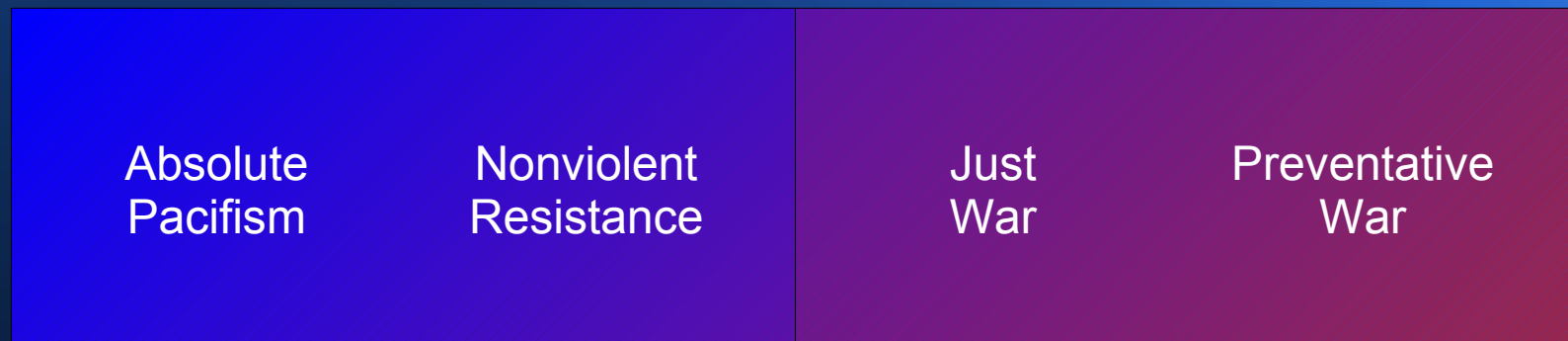
- Able, in theory, to prevent or halt heinous injustice (genocides, etc.)
- The threat of preventative war may stop the injustice in the first place
- Seems to represent Old Testament thinking (particularly from Joshua to David)

- Weaknesses

- Vulnerable to hegemony and empire-building
- Long and sordid history

Spectrum

DEGREE OF MILITARY INTERVENTIONISM



VIOLENCE
NOT
PERMISSIBLE

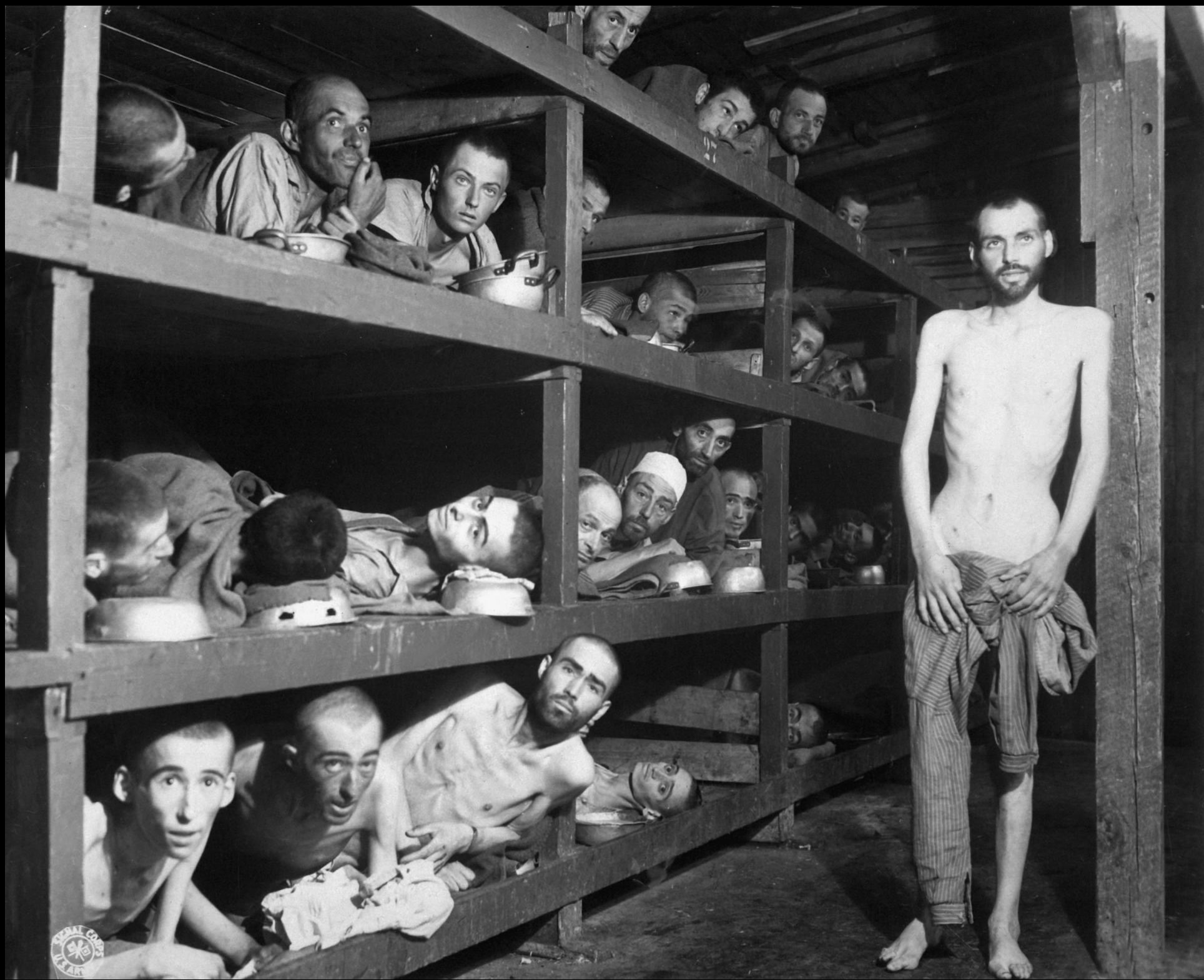
VIOLENCE
PERMISSIBLE

Absolute Pacifism?



To Allies. To General Patton's Army. This is concentration camp Buchenwald. SOS. We need help. They're trying to evacuate us. The SS try to exterminate us.

- Message sent from Polish engineer from radio inside the camp, 8 April 1945



Just War?

- Just Cause (*Jus ad bellum*)
- Just Action (*Jus in bello*)

• **Just Cause** (*Jus ad bellum*)

- The war can be waged only as a last resort, with all nonviolent options exhausted
- The war's weapons must discriminate between combatants and noncombatants
- Its violence must be proportional to the injury we have suffered
- The attackers must have legitimate authority sanctioned by the society they profess to represent.
- The peace it establishes must be a clear improvement over what exists.

Catholic doctrine

- the damage inflicted by the aggressor on the nation or community of nations must be lasting, grave, and certain
- all other means of putting an end to it must have been shown to be impractical or ineffective
- there must be serious prospects of success
- the use of arms must not produce evils and disorders graver than the evil to be eliminated. The power of modern means of destruction weighs very heavily in evaluating this condition

• **Just Action** (*Jus in bello*)

- Military necessity
- Distinction
- Proportionality

Just War?



Just War?



Just War?



“I'm a rapeist” (sic)



Just War?

- 1,325 images of suspected detainee abuse
- 93 video files of suspected detainee abuse
- 660 images of adult pornography
- 546 images of suspected dead Iraqi detainees
- 29 images of soldiers in simulated sexual acts
- 20 images of a soldier with a Swastika drawn between his eyes
- 37 images of Military Working dogs used in abuse of detainees
- 125 images of questionable acts

CID Investigation, June 6, 2004

The Myth of Redemptive Violence

“The Myth of Redemptive Violence is the simplest, laziest, most exciting, uncomplicated, irrational, and primitive depiction of evil the world has even known. Furthermore, its orientation toward evil is one into which virtually all modern children (boys especially) are socialised in the process of maturation. Children select this mythic structure because they have already been led, by culturally reinforced cues and role models, to resonate with its simplistic view of reality. Its presence everywhere is not the result of a conspiracy of Babylonian priests secretly buying up the mass media with Iraqi oil money, but a function of values endlessly reinforced by the Domination System. By making violence pleasurable, fascinating, and entertaining, the Powers are able to delude people into compliance with a system that is cheating them of their very lives.”

- Walter Wink, *Facing the Myth of Redemptive Violence*, 2007

Dinner with anyone dead or alive? Well ... that's a pretty big list ... I think that it might be Gandhi, who is a real hero of mine... He's somebody who I find a lot of inspiration in. He inspired Dr. King, so if it hadn't been for the non-violent movement in India, you might not have seen the same non-violent movement for civil rights here in the United States. He inspired César Chávez, and ... he ended up doing so much and changing the world just by the power of his ethics ... I'm always interested in people who are able to bring about change, not through violence, not through money, but through the force of their personality and their ethical and moral stances.

- President Barack Obama

I face the world as it is, and cannot stand idle in the face of threats to the American people. For make no mistake: Evil does exist in the world. A non-violent movement could not have halted Hitler's armies. Negotiations cannot convince al Qaeda's leaders to lay down their arms. To say that force might sometimes be necessary is not a call to cynicism—it is a recognition of history; the imperfections of man and the limits of reason.

- President Barack Obama
Nobel Peace Prize acceptance speech in Oslo

A false dichotomy?

WAR

PEACE

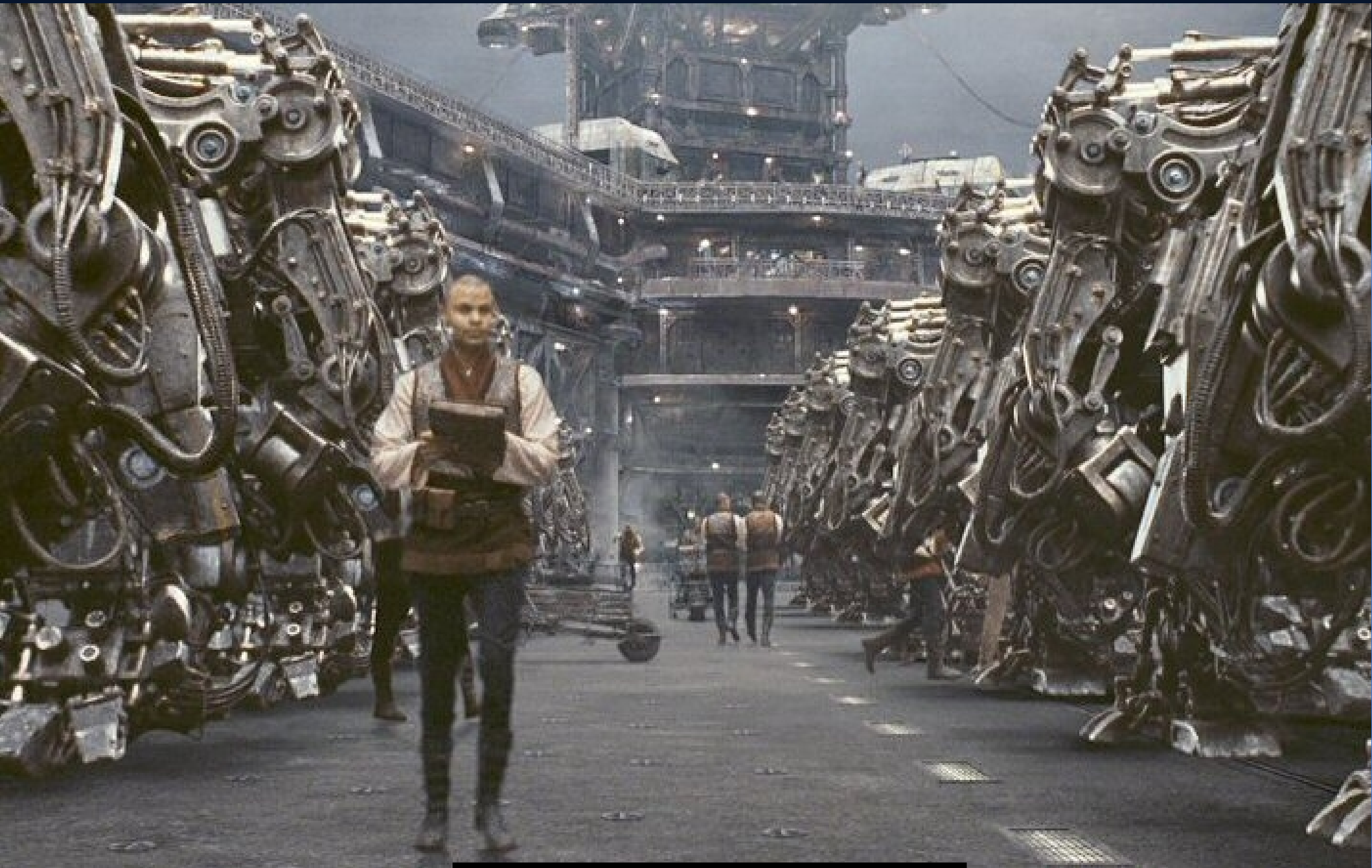
PEACEMAKING

Key Developments & Paradoxes

- Super-empowered individuals
- Quantum leap in C4ISR
- Increased precision
- Cost, obsolescence and lead time issues
- Cyber warfare
- Bio-warfare
- Energy weapons
- Non-lethal technologies
- Unmanned vehicles
- Dual-use technologies

Super-empowered individuals

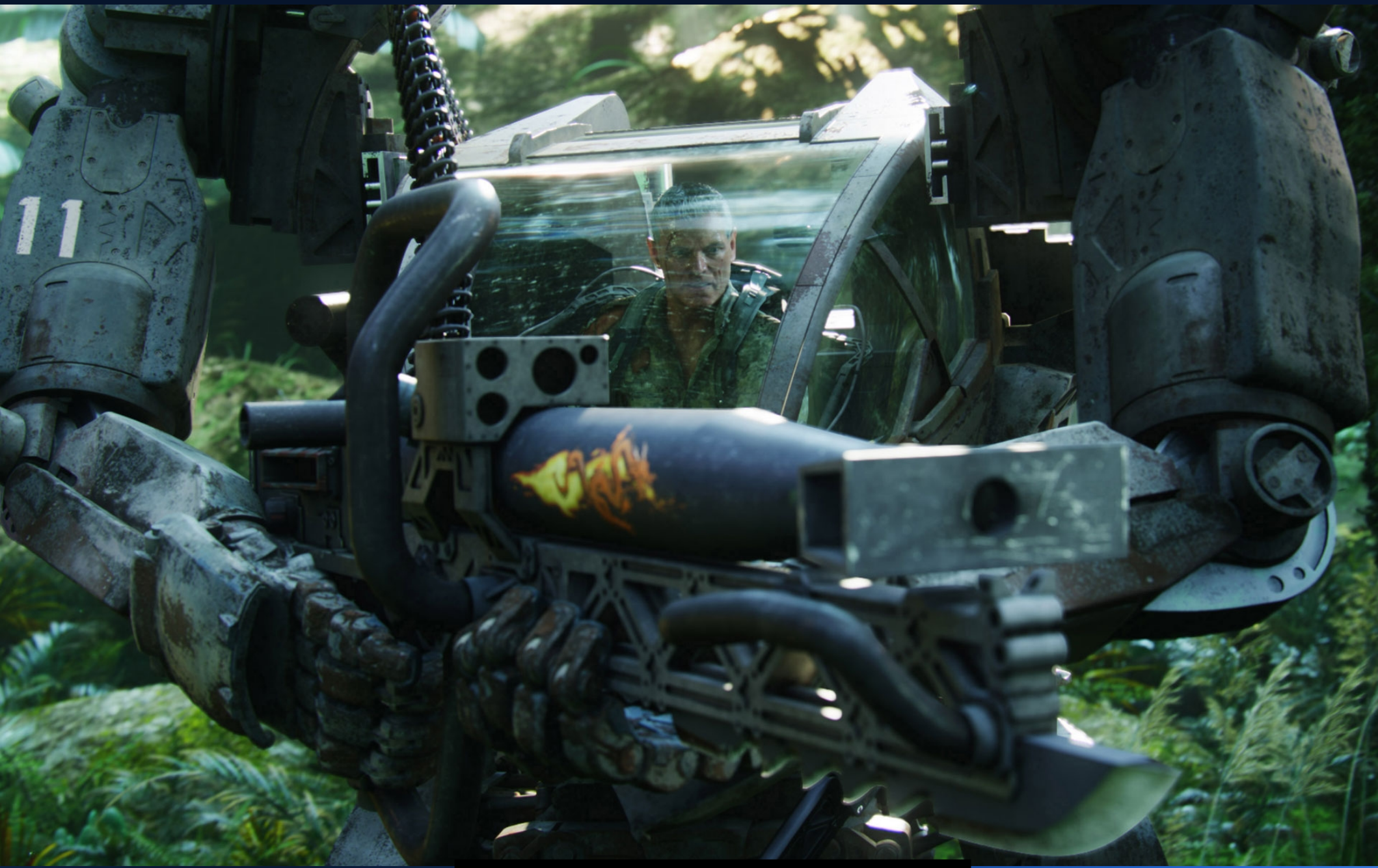
- Fact versus Fiction
- Video: “Iron Man” (2006)
 - feat. Robert Downey Jr.



Matrix Revolutions © 2003



District 9 © 2009



Avatar © 2009

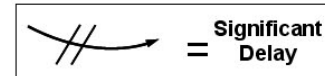
Super-empowered individuals

- In reality, “Iron Man” exoskeletons have questionable utility with foreseeable technology levels due to constraints of fundamental physics
 - Armor energy absorption issues
 - Fuel issues; tactically insignificant range
 - Vulnerable to currently existing, small, portable anti-tank weapons
- Video: Javelin Missile Tank Hit

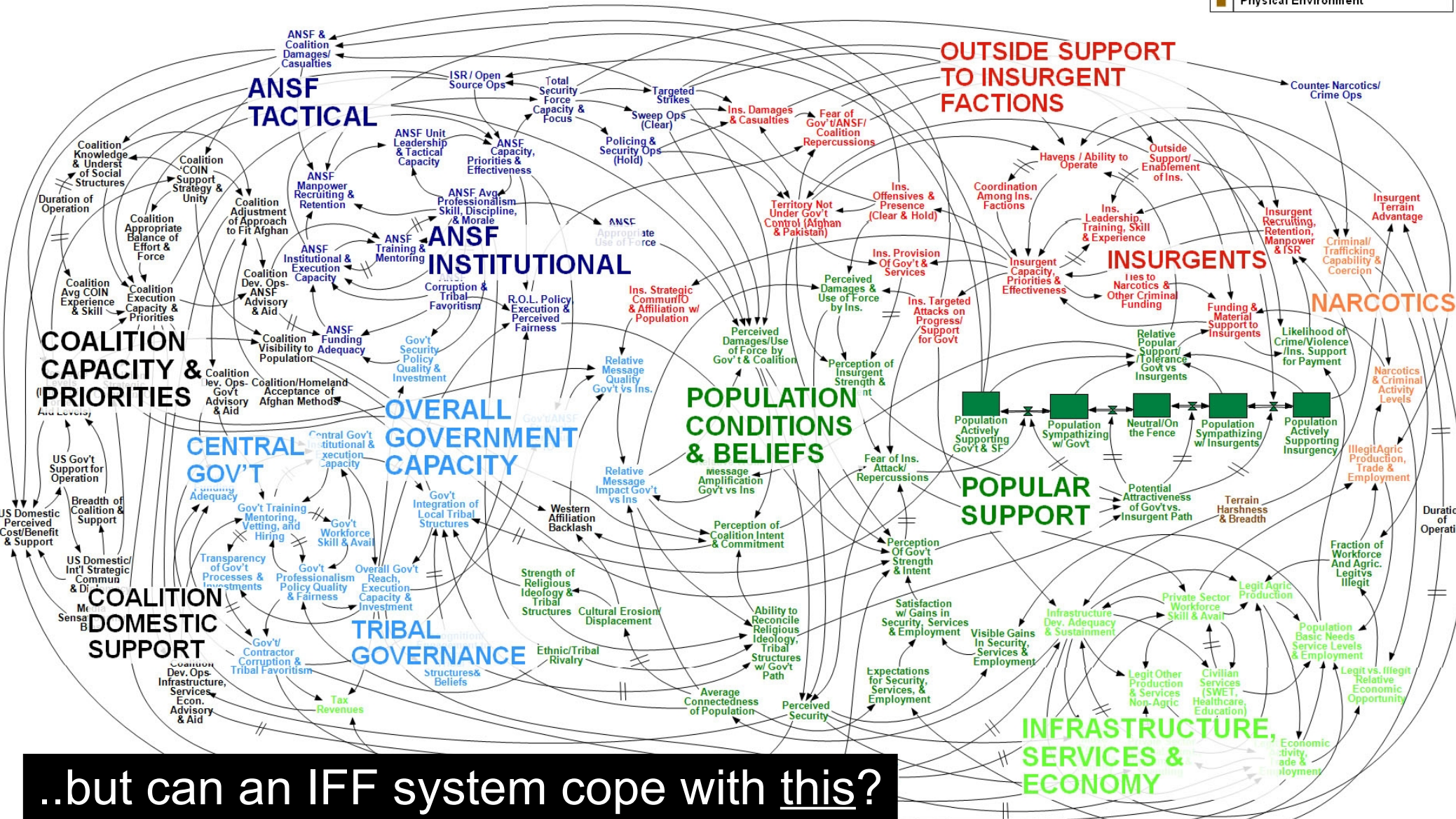


The ultimate “IFF” (Identification Friend or Foe)...

Afghanistan Stability / COIN Dynamics



- Population/Popular Support
- Infrastructure, Economy, & Services
- Government
- Afghanistan Security Forces
- Insurgents
- Crime and Narcotics
- Coalition Forces & Actions
- Physical Environment



..but can an IFF system cope with this?

WORKING DRAFT - V3

Quantum Leap in C4ISR

- C4ISR
 - Command, Control, Communications, Computers
 - Intelligence, Surveillance, Reconnaissance
- Emergence of “COMBAT-ISTAR”



© Knightmare 1997 - <http://home.deckpoint.ch/~yfournier>

1980's technology



2000's technology



2010+ technology



Invasive ISR? Where will it end?

Increased Precision

- Rendered possible largely by the integration of *non-military specific* technologies into guidance systems
 - Global Positioning System (GPS)
 - Miniaturisation of powerful processors
 - Network-centred communications
- Has had a revolutionary impact on rules of engagement and operations.

Increased Precision

- Circular Error Probable = diameter within which 50% of munitions will hit their designated target
 - (Unguided free-fall) = 100m
 - JDAM (GPS/INS Guidance) = 13m
 - GBU-39 SDB (GPS/INS Guidance) = 3m
- 1990 Iraq War ~ < 10% PGM's
- 2003 Iraq War ~ > 90% PGM's



Small Diameter Bomb

Modern cruise missiles can be programmed for mid-course correction (ie. fly away from the target and detonate over an unpopulated area) should the tactical situation at the target area change.





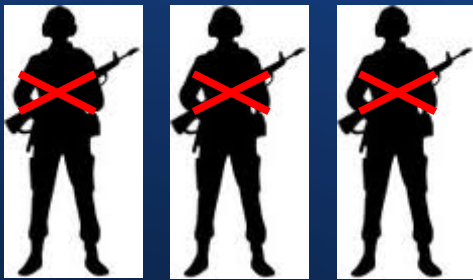
“Guided bullets”

Increased Precision

- Guided bullet
 - Movable aerodynamic aft fins
 - Steered to target using cues from laser or visual targeting system mounted on rifle
- Essentially, this makes the guided bullet more effective at killing...

Increased Precision

... but could a 'guided bullet be employed *less* lethally?



- 3 bullets
- 3 KIA
- 3 removed from fight

- 1 bullet
- 1 WIA, 0 KIA
- 3 removed from fight

Cost, obsolescence & lead times

- Net reduction in %GDP being spent on defence
- Massive consolidation of programs
- Due to tech complexity, long lead times (systems may take 20 years to enter service)
- Linear increase in cost overruns
- Therefore, major programs tend to be very large, complex, late and over budget
- Obsolescence still a serious issue

Chart 2 (U.S. DOD Budgets as a % of GDP – 1945 to 2013E)

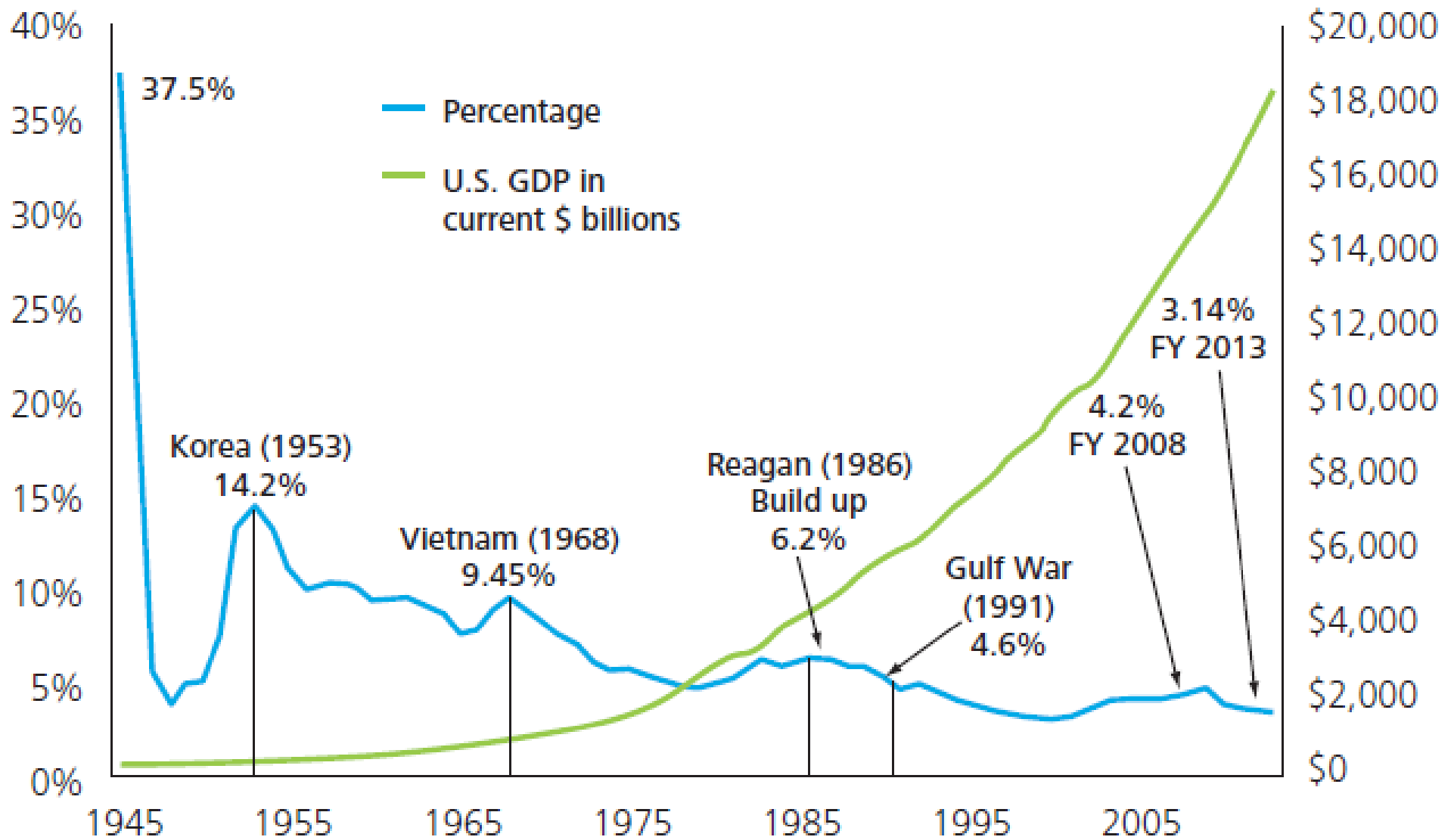
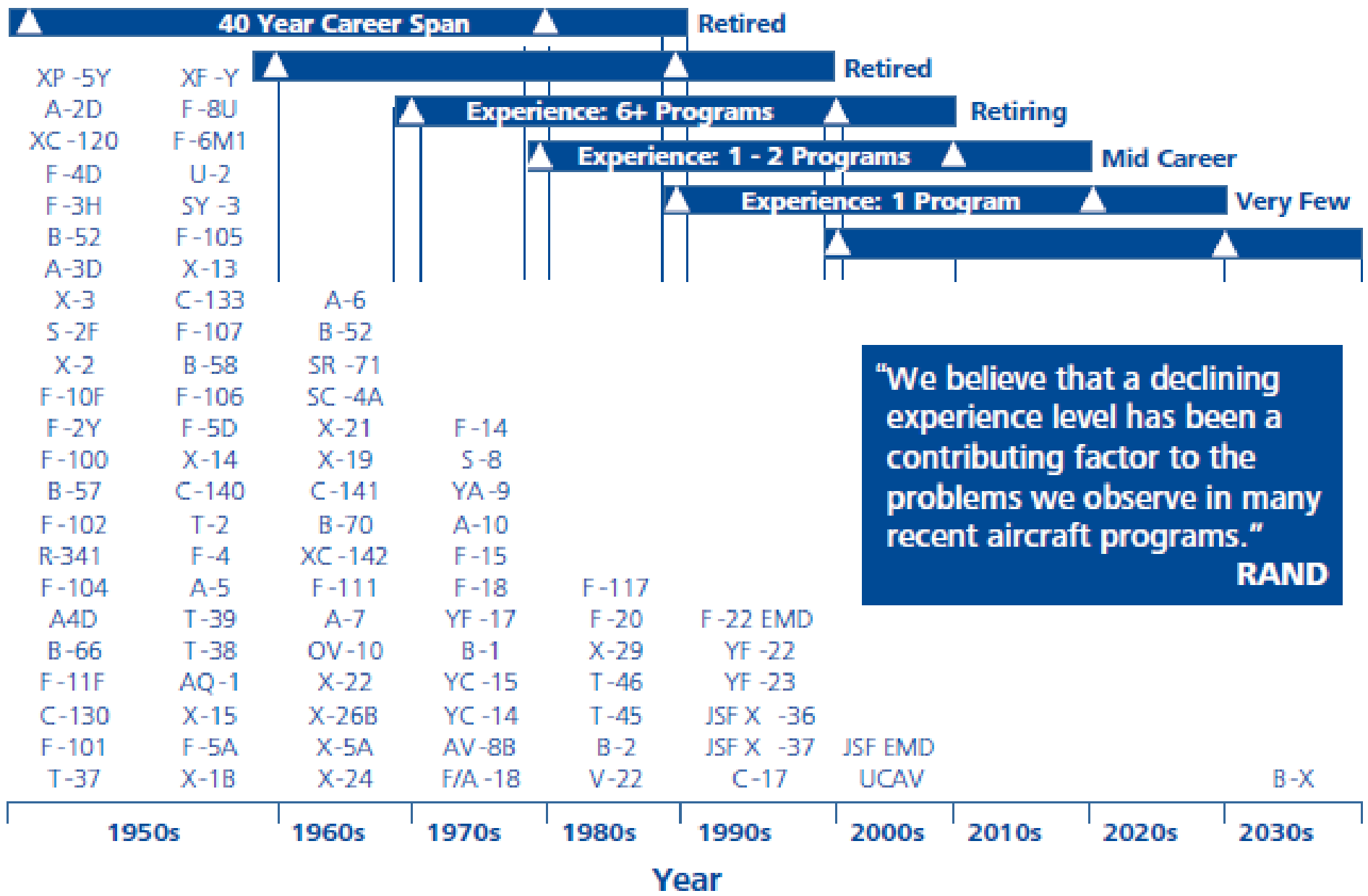


Figure 10: Today's A&D workers have fewer programs to learn from ²²

(Vertical bars: Military aircraft program starts. Horizontal bars: Typical 40 year career span.)



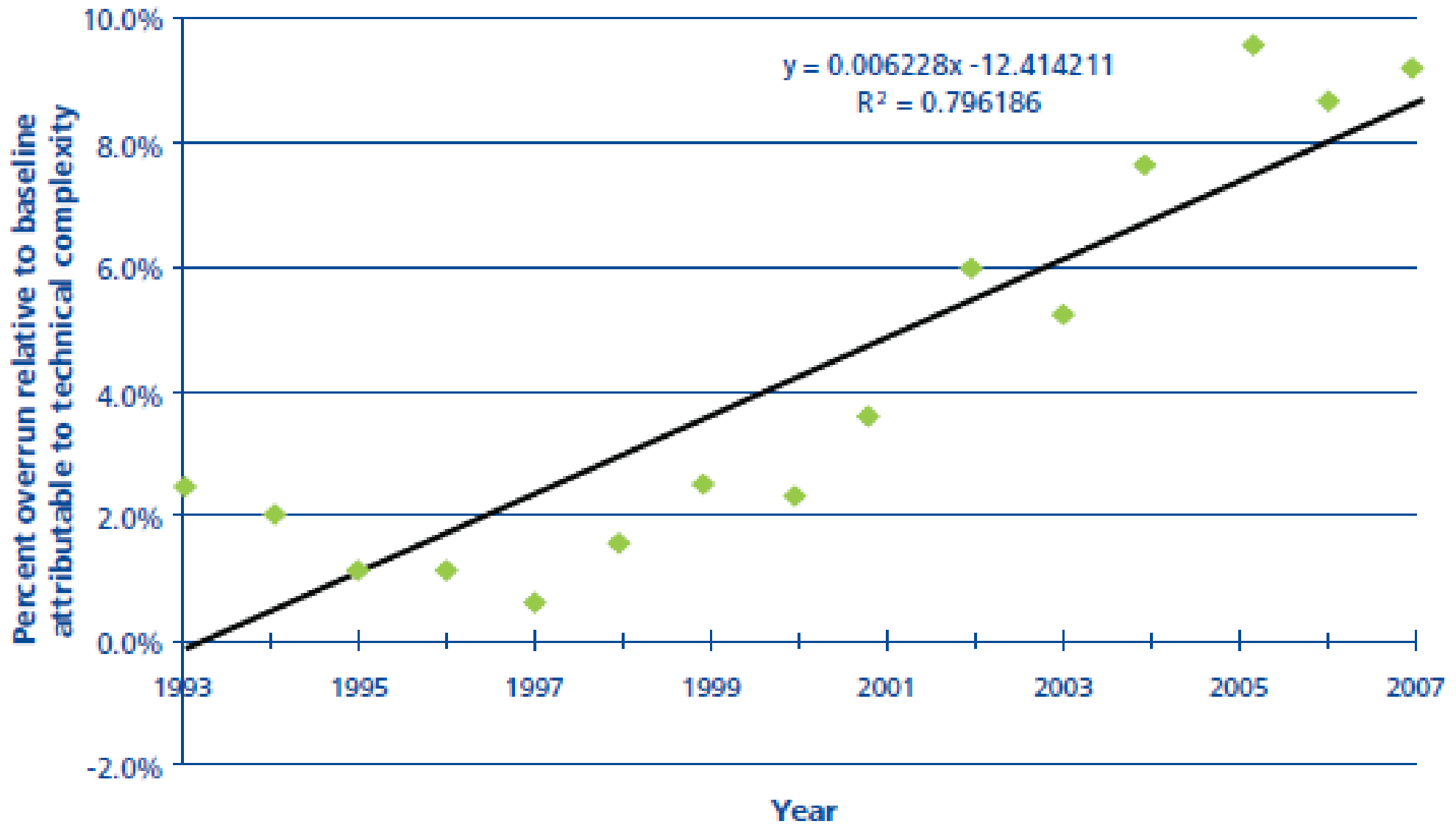
"We believe that a declining experience level has been a contributing factor to the problems we observe in many recent aircraft programs."
RAND

Source: RAND Study (Chart by Northrop Grunman, Aerospace Industries Association)

Figure 6: Today's complex projects take longer than ever ¹¹

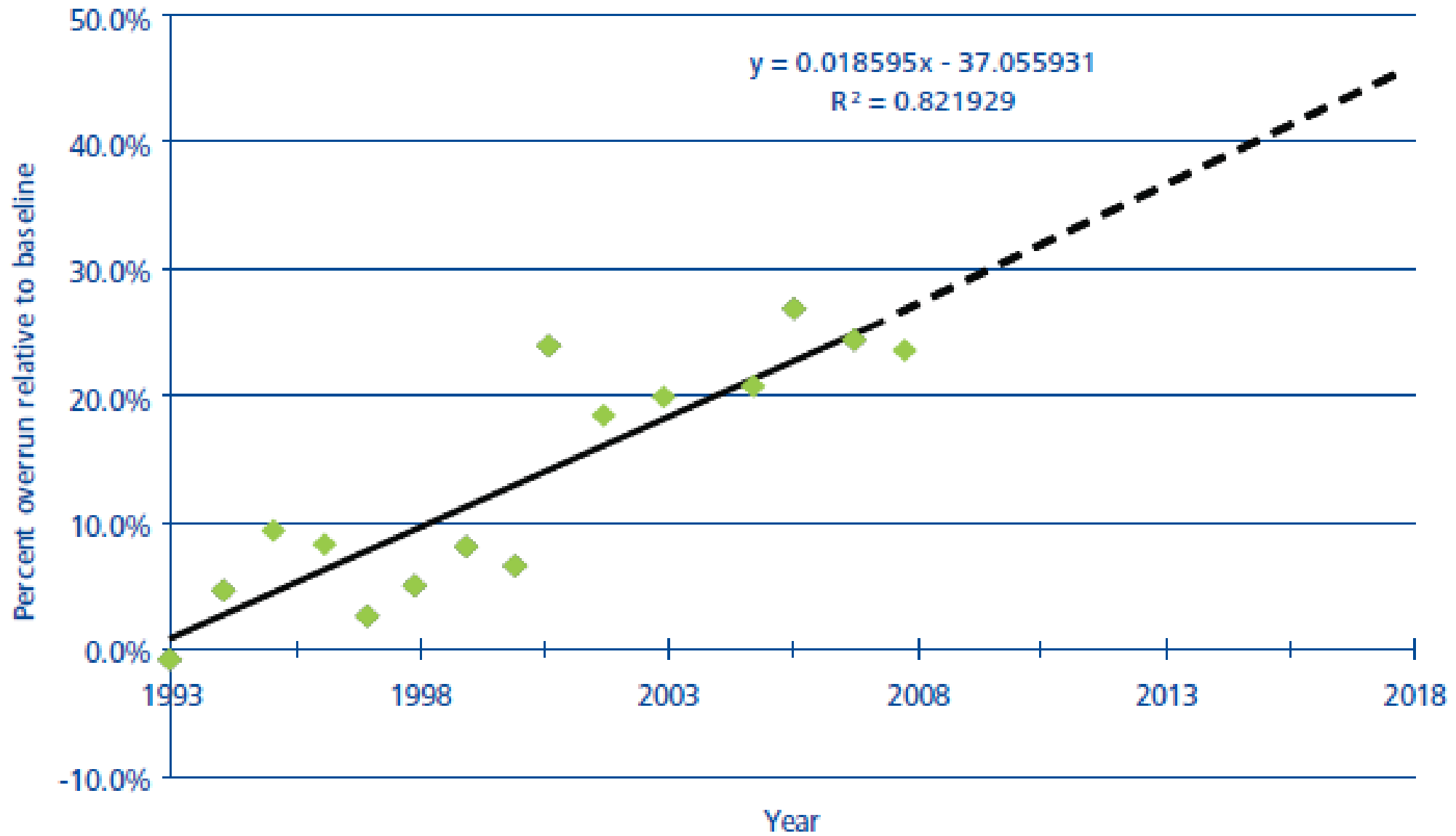
Program and year of first use	Years to 1 st use from contractor start
Historical Programs	
Manhattan Project (1945)	2.5
F-104 (1958)	5
Intercontinental Ballistic Missile (1958)	3.5
SR-71 (1962)	3
Apollo (1967)	8
Recent Programs	
Bomber Program (1993)	11
Satellite Program (2009 expected)	10
Satellite System (to be determined)	>20
Jet Fighter A (2005)	14
Jet Fighter B (2009 expected)	13

Figure 4: Technical complexity increases overruns^B



Note: Analysis based on real baseline year dollars

Figure 1: Budget overruns continue to accelerate ⁶



(Note: analysis based on real baseline year dollars)

Cost, obsolescence & lead times

- Examples
 - Ground-based Midcourse Defense Program = \$31 bil
 - Joint Strike Fighter Program = \$323 bil
 - Annual US Defense personnel costs = \$151 bil
- Compare with
 - Millennium Development Goals = \$50 bil for 5 years
 - Annual \$ spent on pornography worldwide = \$97 bil

'Every gun that is made, every warship launched, every rocket fired signifies, in the final sense, a theft from those who hunger and are not fed, those who are cold and who are not clothed.'

- Dwight Eisenhower

Cost, obsolescence & lead times

- Can we do things smarter? Is there a leaner alternative?
- eg. UCAVs stored in sealed crates until the time of use?
- Massive potential for reduction in direct operating costs



Cyber Warfare

- Already a major issue
- Does not require massive resources to launch an attack
- Attacks can be perpetrated by both state and non-state actors
- 30,000 chinese hackers curently active
- In 2009, Conficker worm prevented French Navy Rafales from taking off



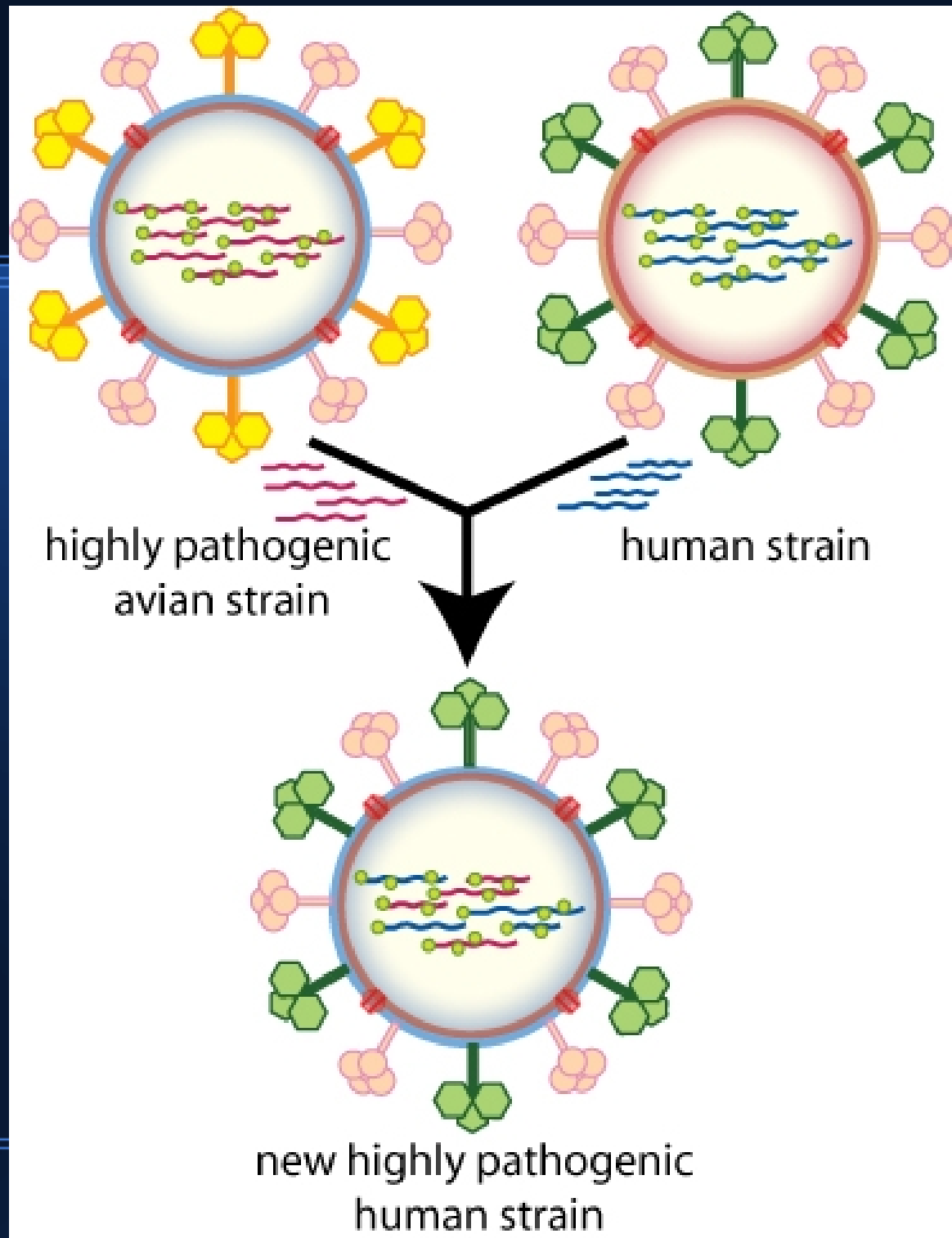
Dassault Rafale

Bio Warfare

- Emerging biotechnology has the greatest potential for catching the world unprepared
- US Army assesses that bioengineering will allow adversaries to modify diseases and tailor organisms to produce pathogens against which there is no existing defense or treatment...

As early as 2015

For less than \$5000



Energy Weapons

- Emerging threat from EMP
- Nuclear detonation no longer required to create the effect.
- Blending the technologies necessary to generate an EMP with advances in miniaturization could produce a hand held EMP gun *before 2020*.

Energy Weapons

- Radio frequency weapons currently under development in Europe are already capable of emanating radio waves that could potentially damage the full range of command and control systems from communications to target acquisition systems currently under development.
- It is expected that EMP weapons will become available to potential adversaries in mortar and artillery rounds soon

2010 Future Technology seminar – Executive Summary

Nonlethal Weapons

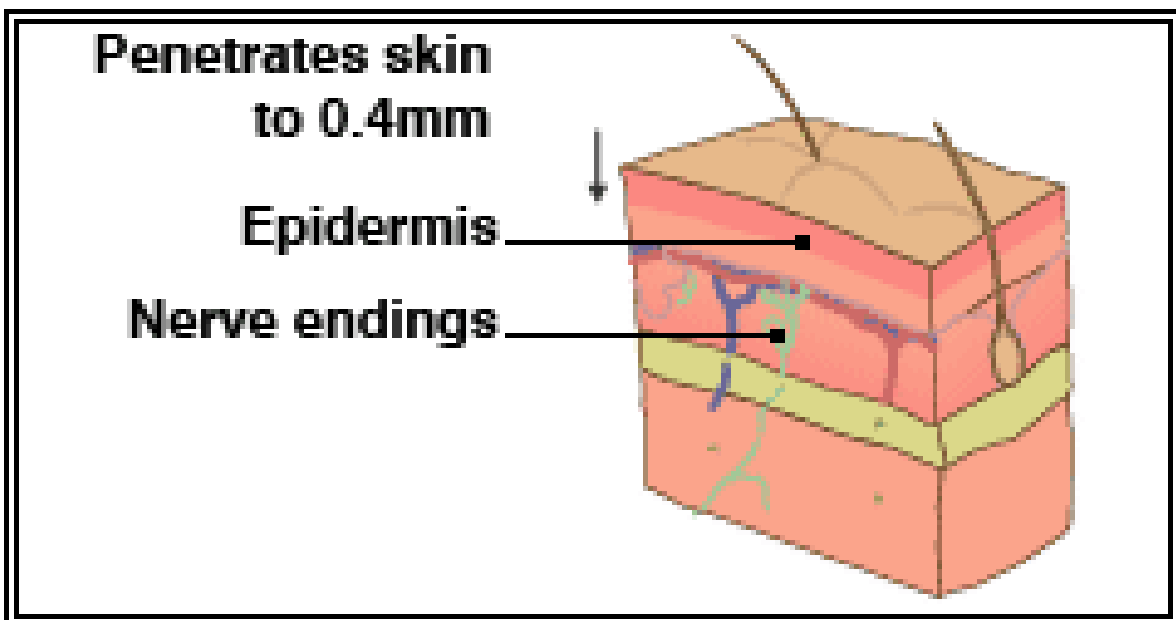
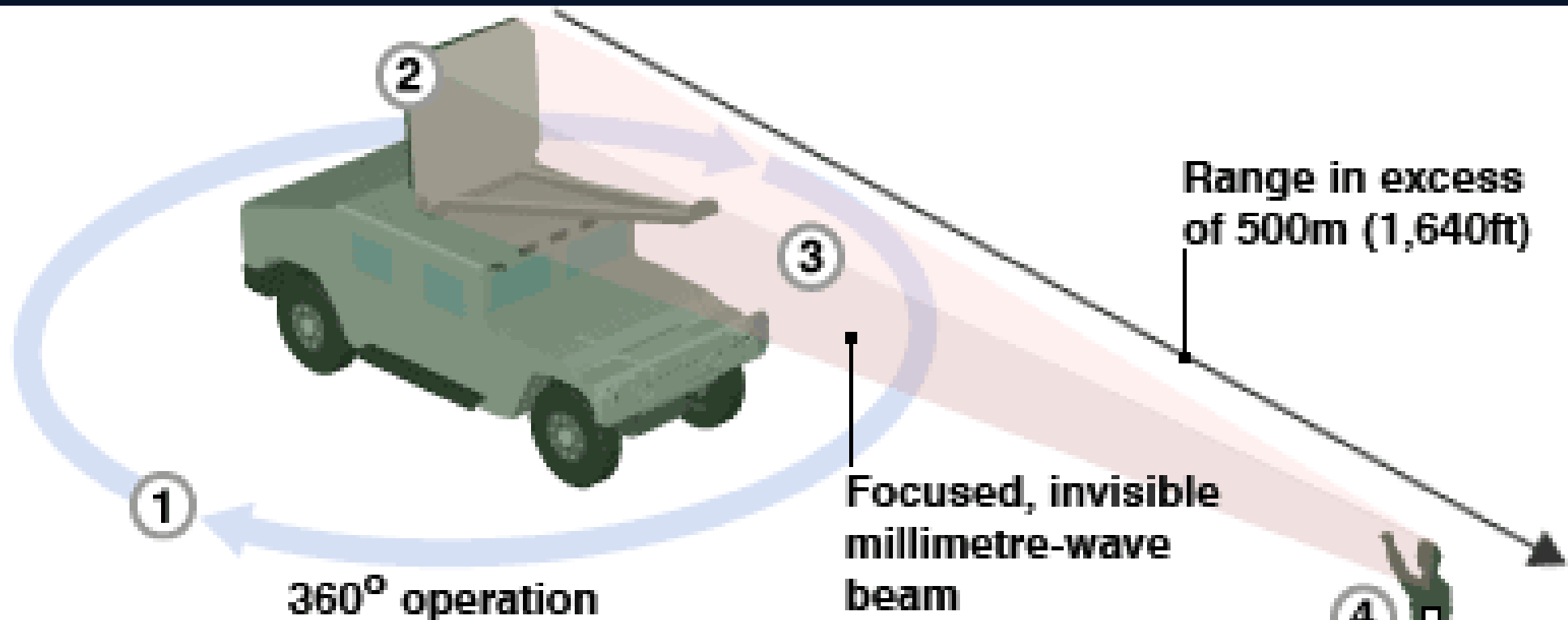
- Sonic weapons
- Low-power energy weapons
- Disruptive weapons (eg. 'Carbon fibre' bomb)
- Psy ops

Why is there no real public debate on this issue?

Nonlethal Weapons



Active Denial System (ADS)



SOURCE: US Military / Raytheon

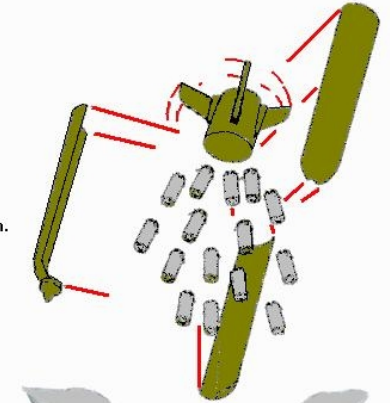
Nonlethal Weapons

BLU-114 Graphite Bomb



CBU-94 / BLU-114/B "Blackout Bomb"

The SUU-66/B Tactical Munitions Dispenser (TMD) splits open, spinning and dispensing about 200 BLU-114/B submunitions, each about the size of a Coke can.



Each BLU-114/B submunition has a small inflatable retarding device, which acts like a parachute, causing the submunition to decelerate and orient vertically.



A small explosive charge detonates, causing the submunition to open releasing a mass of confetti-like thin carbon filament fibers which settle on transformers, causing short circuits that blackout the power grid.



Nonlethal Weapons

Psyops pamphlet air-dropped during Kosovo campaign:

Attention VJ forces!

Right now the world is recording evidence of widespread war crimes by Serb military and paramilitary forces in Kosovo. The emerging picture of atrocities against innocent civilians is clear and compelling.

Detailed intelligence reports are going to the International Criminal Tribunal for the former Yugoslavia at The Hague.

Remember the Nuremberg Trials.

Commanders: every leader is responsible for the actions of his subordinates.

Soldiers: Illegal orders must not be obeyed.

The world is watching you! You will be held accountable.



Nonlethal Weapons

Psyops pamphlet air-dropped during Kosovo campaign:



Translation:

- You can hide but NATO forces still see you.
- Remain in Kosovo and face certain death; or leave your unit and your equipment, and get out of Kosovo now.
- If you choose to stay, NATO forces will relentlessly attack you, with many different weapon systems, from many different nations, from the land, from the sea, and from the sky.
- Stop following Milosevic's orders to commit genocide and other atrocities against civilians in Kosovo.
- You are responsible for your own actions, and ultimately will be held accountable.
- **The Choice is yours.**

Unmanned Vehicles

- Reconnaissance UAVs have been in use for some time
- More recently, UCAVs have moved to the fore, making major contributions to irregular warfare in Iraq and Afghan conflicts. Highly capable, highly persistent.
- Zero risk to pilot, much lower risk of PTSD
- Politically controversial
- Debate over situational awareness - risk of developing a 'Playstation mentality'?

Tactical UAV controller



Playstation controller



RQ-4 Global Hawk



MQ-9 Reaper



Taranis



SWORDS

Weight: 200 lb.

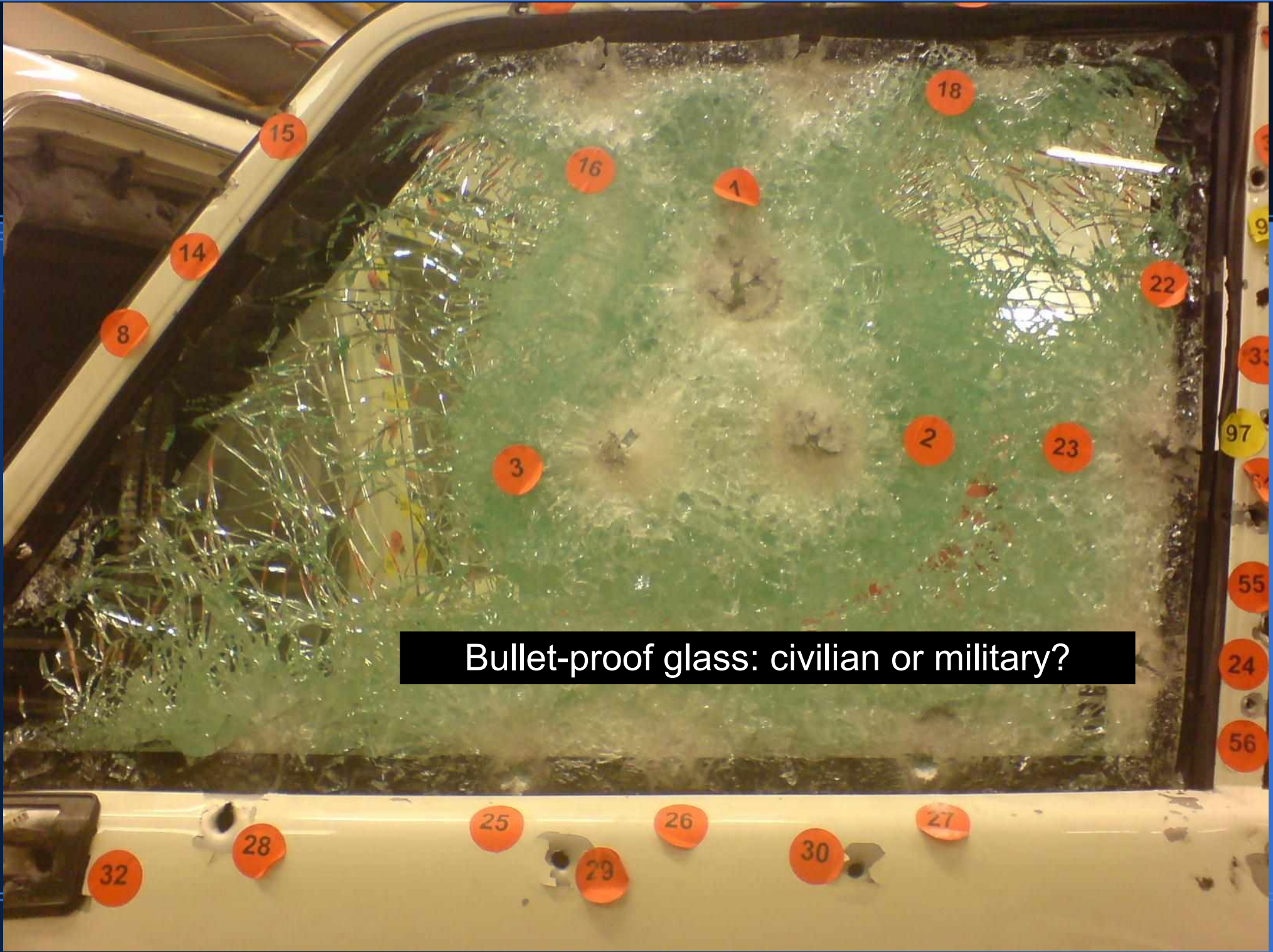
Speed: 4 mph

Weapons: M249 light machine gun

Unmanned Ground Vehicle (UGV)

Dual-use technologies

- This is where the real “convergence of swords and ploughshares” trend kicks in
- Several diverse examples
 - Bullet-proof glass – military or civilian?
 - Military airlift – sometimes the only option for delivery of disaster relief / humanitarian aid to unprepared airstrips strips, etc.
 - MANPADS – is a self-defensive system placed on a civilian airliner classified as military? Or civilian?
 - Immunisations / vaccines against bio-weapons?



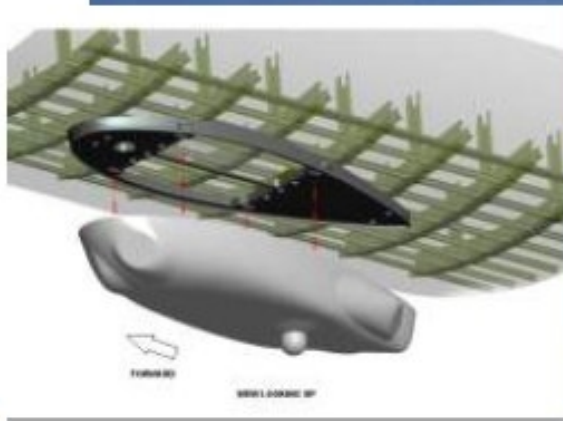
Bullet-proof glass: civilian or military?



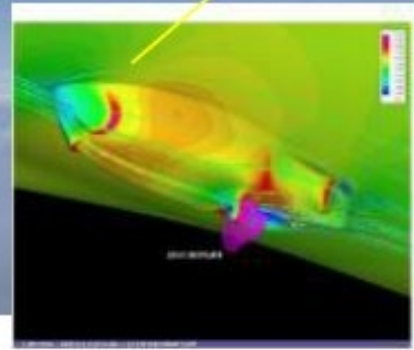
RAAF C-17 deploying relief aid to Pakistan,
August 2010



Flight Deck Indicator Unit for Emergency Ground Notification



Universal Aircraft Mounting Scheme



Computational Fluid Dynamics to Optimize Aerodynamics



Pod with IRCM Equipment Set



Copyright 2005 Northrop Grumman Corporation

MANPADS countermeasures

Final Observations

- Technology “blending”
 - Unconventional countermeasures to combat “blending”
- Declining emphasis on “kinetic kills”
- The psychology of cyberspace
 - Increased risk of soldiers friends and family being directly targeted
- The law of unintended consequences



Mikhail Kalashnikov

Summary

- The dichotomy of War vs Peace is misleading. Our real focus should be on *Peace-making*
- New military technologies will emerge whether Christians want them to or not
- This technology will include *some* prospects for harm minimisation and 'more just' applications of lethal and nonlethal force in conflicts
- But this potential will not be realised unless a conscious, integrated, top-down ethical approach is adopted by politicians, manufacturers and soldiers
- Without this approach, things may get worse, not better

- Video: “The Saints Are Coming” (2006)
 - U2 and Green Day

QUESTIONS?